Section 954

OPEN GRADED SURFACE COURSE

954.01 Scope:

This method of test covers UDOT's design procedure for the "determination of bonding" of Plant Mix Bituminous Seal Coats through the analysis of asphalt cement "drainage."

954.02 Apparatus:

1. Bonding form - A 12 inch square frame with a depth of 1 inch constructed of metal.

2. Double ply cardboard - Double ply cardboard, large enough for coverage by the 12 inch square frame and stiff enough to survive sample removal and for the percent bonding coverage determination.

3. Ovens or hot plates - Ovens for heating aggregates, bituminous material, hot plates for hand utensils and other equipment for the required mixing and molding temperatures. The heating units shall be thermostatically controlled so as to maintain the required temperature within 37 EF. Suitable shields, baffle plates, or sand baths shall be used on the surfaces of the hot plates to minimize localized overheating.

4. Mixing apparatus - Any type of mechanical commercial bread dough mixer, 1 gallon or larger mixer equipped with two metal mixing bowls and two wire whip stirrers may be used, provided that the required temperature can be maintained and produce a well coated, homogenous mixture of the required batch size in the allowable time (2 minutes) and further provided that essentially all of the batch can be recovered.

5. Steel Roller - A 4 inch diameter, 14 inch wide, 30 pound steel pin roller.

6. Miscellaneous equipment:

    6.1 Container for heating aggregates such as flat-bottom metal pans.

    6.2 Containers for heating bitumen such as gill-type tin, beakers, pouring pots, or sauce pans.

    6.3 Mixing tools for spading and hand-mixing.

    6.4 Thermometers for determining temperatures of aggregates, bitumen and bituminous mixtures (A.S.T.M. approved). A range of 100EF to 401EF. With a sensitivity of 33EF is required.

    6.5 A balance with a capacity of at least 10,000 g. and sensitive to 0.1 g. for batching mixtures.

    6.6 Gloves for handling hot equipment.

6.7 Marking crayons for identifying specimens.

6.8 A flat-bottom scoop for batching aggregates.

6.9 Large spoon or sugar scoop for placing bituminous mixtures in specimen molds.

6.10 Any additional safety equipment deemed necessary.

954.03 Determination of Mixing Temperatures:

Mixing temperatures are determined by asphalt grade and supplier. The information on mixing temperatures of asphalts can be obtained by calling the Region Materials Engineer.

The aggregate intended for use shall be dried to constant weight at a temperature of 230EF ± 41 EF. The aggregate shall then be separated into the desired size fractions by dry sieving.

The aggregate shall be batched in accordance with the target gradation of the gradation specified. For the job mix design, the aggregate shall be batched in accordance with the gradation the plant is capable of producing and shall be within the range established in the specifications. The aggregate shall be heated to the same temperature as the recommended asphalt mixing temperature specified by the Region Materials Engineer.

954.04 Bituminous Binder:

The bituminous binder used shall be Performance Grade (PG) asphalt cement. The bituminous binder for the job mix design shall be of the same supplier and grade as that proposed for use on the project.

954.05 Bonding and Preparation of the Plant Mix Seal Coat.

1. In order to determine the optimum asphalt content, the bonding samples shall be made using a 5300 g representative dry aggregate sample, in the case where slag is used in place of natural aggregate, the size of the sample will vary according to the volume of the slag. The asphalt content shall be selected based on a minimum of four samples. Tests should be planned on the basis of 0.5% increments of AC content, with at least two AC contents falling below the selected asphalt content value and at least one about this value.

   After batching and mixing the asphalt mix, the mix shall be placed in the 12 inch square frame over the double-ply cardboard canvas and compacted with the steel roller by rolling a minimum of twenty passes, ten passes forward and ten passes back. Perform 5 passes forward and five passes back, rotate the frame 90 degrees and perform the remaining passes normal to the initial passes. The matrix shall be allowed to cool for 10 minutes. Then the material should be removed from the cardboard. This will allow the determination of the percent of bond through visual examination. Selection of the optimum asphalt content will be based on a 70-90 percent coverage of the cardboard surface.

2. An additional sample will be batched and analyzed for verification of the 70-90 percent coverage

   Example: 6.0%, 6.5%, 7.0%, and 7.5% are the initially selected asphalt contents. After batching and processing the asphalt mix, the "drainage" is examined. First verifying that sequentially larger amounts of drainage occur as the asphalt content is increased. Secondly, the determination of the optimum asphalt content (70-90 percent coverage).

   The optimum asphalt content will probably fall between two of the initially selected asphalt contents. For example, it is determined that the optimum content falls between 6.5% and 7.0%. Based on the percent coverage, a 6.8% asphalt content is expected to be the desired target. An additional sample is batched and the optimum asphalt content is verified. A design asphalt content is now established for the specific job mix.

   (This example would meet the criteria of having a minimum of two batched samples falling below and one above the selected optimum asphalt content of 6.8%. It is necessary to establish a minimum of two points below and one above to verify that no inconsistencies exist in the selection process of the optimum asphalt design content.)